

Iowa Army Ammunition Plant
Middletown
Des Moines County
Iowa

HAER No. IA-13

HAER
IOWA,
29-MIDT0,
1-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, DC 20013-7127

HAER
IOWA,
29-MIDTO,
1--

HISTORIC AMERICAN ENGINEERING RECORD

Iowa Army Ammunition Plant

IA-13

Location: In Des Moines County, Iowa immediately south of Middletown, and about 10 miles west of Burlington.

Date of Construction: Established in 1941.

Owner: Department of the Army

Significance: Established in 1941, as a government-owned, contractor operated plant Iowa Army Ammunition Plant was used during WW II and the Korean war to assemble and pack bombs, mines, and artillery shells, as well as constituent boosters, detonators, fuzes, and primers.

Historical Report
Prepared by: Jeffrey A. Hess, 1984.

Prepared for
Transmittal by: Robie S. Lange, HABS/HAER, 1985.

EXECUTIVE SUMMARY

Iowa Army Ammunition Plant (IAAP) is a part of the Army's Armament, Munitions and Chemical Command (AMCCOM). The installation is a government-owned, contractor-operated plant occupying 19,124 acres in Des Moines County in southeastern Iowa. Located immediately south of the City of Middletown and about ten miles west of the City of Burlington, IAAP was constructed in 1941 to load, assemble and pack bombs, mines, and artillery shells, as well as constituent boosters, detonators, fuzes, and primers. Placed in standby condition after V-J Day, IAAP was reactivated for Korean War production and has remained in operation to the present time. As a result of piecemeal equipment replacement during the late 1960s and extensive modernization programs during the 1970s, the installation no longer retains its original World War II technology. Current production emphasizes loading, assembling, and packing large-caliber artillery projectiles, missile warheads, and explosive-train components. In addition to conventional munitions lines, IAAP also operated an atomic-bomb production complex, constructed for the Atomic Energy Commission during the late 1940s and 1950s. This facility ceased operation in 1975.

At present, IAAP comprises about 1,150 buildings, more than four-fifths of which date from the World War II period. The plant also contains thirty-four structures antedating military use of the site. These consist of twenty-seven architecturally modest farmhouses, two utilitarian barns, two maintenance facilities originally constructed for the Des Moines County Home, two former school buildings, and an underground, stone vault,

built in 1867, that once served as a fruit and cider cellar for the Avery orchard estate. There are no Category I historic properties at IAAP. The Avery Fruit Cellar (no building number assigned) is a Category II historic property; it is a major and rare architectural artifact of southeastern Iowa's once-flourishing orchard industry. Winnebago School (Building 500-30-6), erected in 1872, is a Category III historic property. In use for almost seventy years, the school is a local, historic landmark and a good example of vernacular stone architecture.

CONTENTS

Executive Summary

PREFACE 1

1. INTRODUCTION 3

 Scope 3

 Methodology 4

2. HISTORIC OVERVIEW 14

 Background 14

 World War II 16

 Korean War to the Present 46

3. PRESERVATION RECOMMENDATIONS 54

 Background 54

 Category I Historic Properties 59

 Category II Historic Properties 60

 Category III Historic Properties 62

BIBLIOGRAPHY 65

APPENDIX 69

PREFACE

This report presents the results of an historic properties survey of the Iowa Army Ammunition Plant (IAAP). Prepared for the United States Army Materiel Development and Readiness Command (DARCOM), the report is intended to assist the Army in bringing this installation into compliance with the National Historic Preservation Act of 1966 and its amendments, and related federal laws and regulations. To this end, the report focuses on the identification, evaluation, documentation, nomination, and preservation of historic properties at the IAAP. Chapter 1 sets forth the survey's scope and methodology; Chapter 2 presents an architectural, historical, and technological overview of the installation and its properties; and Chapter 3 identifies significant properties by Army category and sets forth preservation recommendations. Illustrations and an annotated bibliography supplement the text.

This report is part of a program initiated through a memorandum of agreement between the National Park Service, Department of the Interior, and the U.S. Department of the Army. The program covers 74 DARCOM installations and has two components: 1) a survey of historic properties (districts, buildings, structures, and objects), and 2) the development of archaeological overviews. Stanley H. Fried, Chief, Real Estate Branch of Headquarters DARCOM, directed the program for the Army, and Dr. Robert J. Kapsch, Chief of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) directed the program for the National Park Service. Sally Kress Tompkins was program manager, and Robie S. Lange was

project manager for the historic properties survey. Technical assistance was provided by Donald C. Jackson.

Building Technology Incorporated acted as primary contractor to HABS/HAER for the historic properties survey. William A. Brenner was BTI's principal-in-charge and Dr. Larry D. Lankton was the chief technical consultant. Major subcontractors were the MacDonald and Mack Partnership and Jeffrey A. Hess. The author of this report was Jeffrey A. Hess. The author would like to thank the many employees at IAAP who graciously assisted him in his research and field surveys. He especially acknowledges the help of the following individuals: on the government staff, Lt. Col. Kernan Nucci, Commander; Robert Arbige, Chief, Operations Review Division; and Billy Clements, Equipment Specialist; and on the contractor staff, Richard Tiemeir, Plant Engineering Manager; and Dan Bied, Administrative Assistant, Safety and Security.

The complete HABS/HAER documentation for this installation will be included in the HABS/HAER collections at the Library of Congress, Prints and Photographs Division, under the designation HAER No. IA-13.

Chapter 1

INTRODUCTION

SCOPE

This report is based on an historic properties survey conducted in December 1983 of all Army-owned properties located within the official boundaries of the Iowa Army Ammunition Plant (IAAP). The survey included the following tasks:

- . Completion of documentary research on the history of the installation and its properties.
- . Completion of a field inventory of all properties at the installation.
- . Preparation of a combined architectural, historical, and technological overview for the installation.
- . Evaluation of historic properties and development of recommendations for preservation of these properties.

Also completed as a part of the historic properties survey of the installation, but not included in this report, are HABS/HAER Inventory cards for 30 individual properties. These cards, which constitute HABS/HAER Documentation Level IV, will be provided to the Department of the Army. Archival copies of the cards, with their accompanying photographic

negatives, will be transmitted to the HABS/HAER collections at the Library of Congress.

The methodology used to complete these tasks is described in the following section of this report.

METHODOLOGY

1. Documentary Research

IAAP was one of several government-owned, government-operated facilities constructed during 1940-1941 for the manufacture of ammunition. Since the installation was part of a larger manufacturing network, an evaluation of its historical significance requires a general understanding of the nation's wartime munitions industry. To identify relevant published sources, research on munitions manufacturing during World War II, the Korean War, and the Vietnam War was conducted in standard bibliographies of military history, engineering, and the applied sciences. Unpublished sources were identified by researching the historical and technical archives of the U.S. Army Armament, Munitions and Chemical Command (AMCCOM) at Rock Island Arsenal in Rock Island, Illinois.¹

In addition to such industry-wide research, a concerted effort was made to locate sources dealing specifically with the history and technology of IAAP. This site-specific research was conducted primarily at the AMCCOM Historical Office at Rock Island Arsenal; the

government and contractor archives at IAAP; the Burlington Public Library in Burlington, Iowa, and the Des Moines County Historical Society in Burlington. The Iowa State Historic Preservation Office (Iowa State Historical Department, Des Moines) was also contacted for information on IAAP, but the agency had no data on structures located within the boundaries of the installation.

Army records used for the field inventory included current Real Property Inventory (RPI) printouts that listed all officially recorded buildings and structures by facility classification and date of construction; the installation's property record cards; base maps and photographs supplied by installation personnel; and installation master planning, archaeological, environmental assessment, and related reports and documents. A complete listing of this documentary material may be found in the bibliography.

2. Field Inventory

Architectural and technological field surveys were conducted in December 1983 by Jeffrey A. Hess. Following a general discussion of the project with Robert Arbige, Chief, Operations Review Division, the surveyor inspected major manufacturing facilities and completed a field inspection of the installation. Billy Clements, Equipment Specialist, served as escort. All plant areas and facilities were surveyed, except for the interior spaces of Lines 1, 2, 4A, 5B, and 9, which were excluded for security reasons (see Appendix).

Field inventory procedures were based on the HABS/HAER Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures.² All areas and properties were visually surveyed.

Building locations and approximate dates of construction were noted from the installation's property records and field-verified. Interior surveys were made of the major facilities to permit adequate evaluation of architectural features, building technology, and production equipment.

Field inventory forms were prepared for, and black and white 35 mm photographs taken of all buildings and structures through 1945 except basic utilitarian structures of no architectural, historical, or technological interest. When groups of similar ("prototypical") buildings were found, one field form was normally prepared to represent all buildings of that type. Field inventory forms were also completed for representative post-1945 buildings and structures.³

Information collected on the field forms was later evaluated, condensed, and transferred to HABS/HAER Inventory cards.

3. Historical Overview

A combined architectural, historical, and technological overview was prepared from information developed from the documentary research and the field inventory. It was written in two parts: 1) an introductory description of the installation, and 2) a history of the installation by periods of development, beginning with pre-military land uses.

Maps and photographs were selected to supplement the text as appropriate.

The objectives of the overview were to 1) establish the periods of major construction at the installation, 2) identify important events and individuals associated with specific historic properties, 3) describe patterns and locations of historic property types, and 4) analyze specific building and industrial technologies employed at the installation.

4. Property Evaluation and Preservation Measures

Based on information developed in the historical overviews, properties were first evaluated for historical significance in accordance with the eligibility criteria for nomination to the National Register of Historic Places. These criteria require that eligible properties possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that they meet one or more of the following:⁴

- A. Are associated with events that have made a significant contribution to the broad patterns of our history.
- B. Are associated with the lives of persons significant in the nation's past.

- C. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.

- D. Have yielded, or may be likely to yield, information important in pre-history or history.

Properties thus evaluated were further assessed for placement in one of five Army historic property categories as described in Army Regulation 420-40:⁵

- Category I Properties of major importance
- Category II Properties of importance
- Category III Properties of minor importance
- Category IV Properties of little or no importance
- Category V Properties detrimental to the significance of adjacent historic properties.

Based on an extensive review of the architectural, historical, and technological resources identified on DARCOM installations nationwide, four criteria were developed to help determine the appropriate categorization level for each Army property. These criteria were used to assess the importance not only of properties of traditional historical interest, but also of the vast number of standardized or prototypical buildings, structures and production processes that were

built and put into service during World War II, as well as of properties associated with many post-war technological achievements. The four criteria were often used in combination and are as follows:

- 1) Degree of importance as a work of architectural, engineering, or industrial design. This criterion took into account the qualitative factors by which design is normally judged: artistic merit, workmanship, appropriate use of materials, and functionality.

- 2) Degree of rarity as a remaining example of a once widely used architectural, engineering, or industrial design or process. This criterion was applied primarily to the many standardized or prototypical DARCOM buildings, structures, or industrial processes. The more widespread or influential the design or process, the greater the importance of the remaining examples of the design or process was considered to be. This criterion was also used for non-military structures such as farmhouses and other once prevalent building types.

- 3) Degree of integrity or completeness. This criterion compared the current condition, appearance, and function of a building, structure, architectural assemblage, or industrial process to its original or most historically important condition, appearance, and function. Those properties that were highly intact were generally considered of greater importance than those that were not.

- 4) Degree of association with an important person, program, or event. This criterion was used to examine the relationship of a property to a famous personage, wartime project, or similar factor that lent the property special importance.

The majority of DARCOM properties were built just prior to or during World War II, and special attention was given to their evaluation. Those that still remain do not often possess individual importance, but collectively they represent the remnants of a vast construction undertaking whose architectural, historical, and technological importance needed to be assessed before their numbers diminished further. This assessment centered on an extensive review of the military construction of the 1940-1945 period, and its contribution to the history of World War II and the post-war Army landscape.

Because technology has advanced so rapidly since the war, post-World War II properties were also given attention. These properties were evaluated in terms of the nation's more recent accomplishments in weaponry, rocketry, electronics, and related technological and scientific endeavors. Thus the traditional definition of "historic" as a property 50 or more years old was not germane in the assessment of either World War II or post-war DARCOM buildings and structures; rather, the historic importance of all properties was evaluated as completely as possible regardless of age.

Property designations by category are expected to be useful for approximately ten years, after which all categorizations should be reviewed and updated.

Following this categorization procedure, Category I, II, and III historic properties were analyzed in terms of:

- . Current structural condition and state of repair. This information was taken from the field inventory forms and photographs, and was often supplemented by rechecking with facilities engineering personnel.

- . The nature of possible future adverse impacts to the property. This information was gathered from the installation's master planning documents and rechecked with facilities engineering personnel.

Based on the above considerations, the general preservation recommendations presented in Chapter 3 for Category I, II, and III historic properties were developed. Special preservation recommendations were created for individual properties as circumstances required.

5. Report Review

Prior to being completed in final form, this report was subjected to an in-house review by Building Technology Incorporated. It was then

sent in draft to the subject installation for comment and clearance and, with its associated historical materials, to HABS/HAER staff for technical review. When the installation cleared the report, additional draft copies were sent to DARCOM, the appropriate State Historic Preservation Officer, and, when requested, to the archaeological contractor performing parallel work at the installation. The report was revised based on all comments collected, then published in final form.

NOTES

1. The following bibliographies of published sources were consulted: Industrial Arts Index, 1938-1957; Applied Science and Technology Index, 1958-1980; Engineering Index, 1938-1983; Robin Higham, ed., A Guide to the Sources of United States Military History (Hamden, Conn.: Archon Books, 1975); John E. Jessup and Robert W. Coakley, A Guide to the Study and Use of Military History (Washington, D.C.: U.S. Government Printing Office, 1979); "Military Installations," Public Works History in the United States, eds., Suellen M. Hoy and Michael C. Robinson (Nashville: American Association for State and Local History, 1982), pp. 380-400. AMCCOM (formerly ARRCOM, or U.S. Army Materiel Readiness Command) is the military agency responsible for supervising the operation of government-owned munitions plants; its headquarters are located at Rock Island Arsenal, Rock Island, Illinois. Although there is no comprehensive index to AMCCOM archival holdings, the agency's microfiche collection of unpublished reports is itemized in ARRCOM, Catalog of Common Sources, Fiscal Year 1983, 2 vols. (no pl.: Historical Office, AMCCOM, Rock Island Arsenal, n.d.).
2. Historic American Buildings Survey/Historic American Engineering Record, National Park Service, Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures (unpublished draft, 1982).
3. Representative post-World War II buildings and structures were defined as properties that were: (a) "representative" by virtue of construction type, architectural type, function, or a combination of these, (b) of obvious Category I, II, or III historic importance, or (c) prominent on the installation by virtue of size, location, or other distinctive feature.
4. National Park Service, How to Complete National Register Forms (Washington, D.C.: U.S. Government Printing Office, January 1977).

5. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).

Chapter 2

HISTORICAL OVERVIEW

BACKGROUND

Iowa Army Ammunition Plant (IAAP) is a government-owned, contractor-operated installation occupying 19,124 acres in Des Moines County in southeastern Iowa (Figure 1). Located immediately south of the City of Middletown and about ten miles west of the City of Burlington, the plant was constructed in 1941 to load, assemble and pack bombs, mines, and artillery shells, as well as constituent boosters, detonators, fuzes, and primers. Placed in standby condition after V-J Day, IAAP was reactivated for Korean War production and has remained in operation to the present time. As a result of piecemeal equipment replacement during the late 1960s and extensive modernization programs during the 1970s, the installation no longer retains its original World War II technology. Current production emphasizes loading, assembling, and packing large-caliber artillery projectiles, missile warheads, and explosive-train components. In addition to conventional munitions lines, IAAP also operated an atomic-bomb production complex, constructed for the Atomic Energy Commission during the late 1940s and 1950s. This facility ceased operation in 1975. At present, IAAP comprises about 1,150 buildings, more than four-fifths of which date from the World War II period.

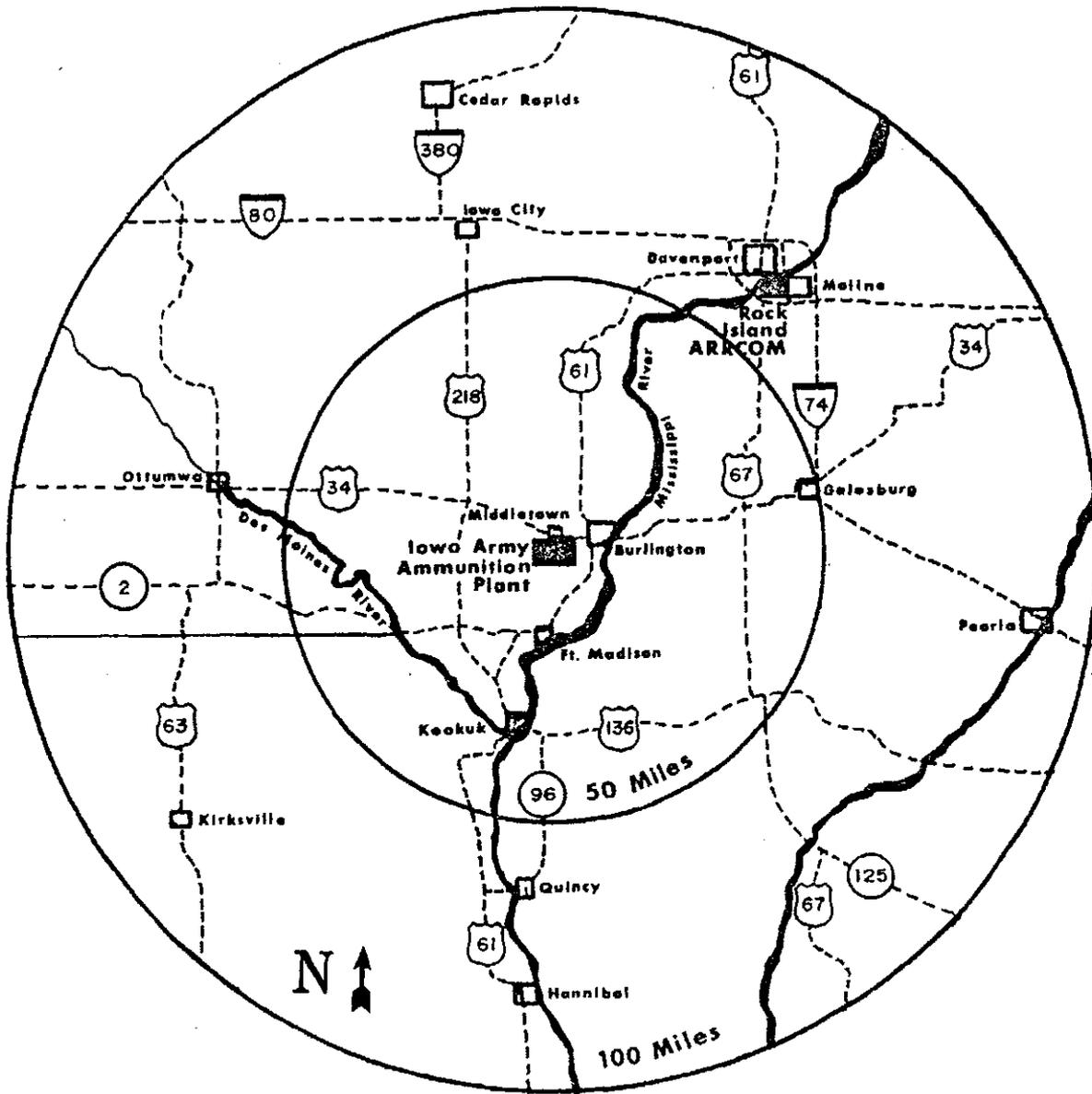


Figure 1: Location Map. (Source: "Iowa Army Ammunition Plant," unpublished brochure prepared by Mason & Hanger-Silas Mason Co., Inc., c. 1980, IAAP Administrative Archives.)

WORLD WAR II

When war broke out in Europe in the fall of 1939, the United States had virtually no industrial capacity for manufacturing military ammunition. As historians Harry C. Thomson and Lida Mayo observe in their authoritative work on American munitions production:

Only a handful of small plants were making propellant powder and high explosives, and there were virtually no facilities for the mass loading and assembling of heavy ammunition. American industry was just beginning, through educational orders, to learn techniques for forging and machining shells and producing intricate fuze mechanisms. The only sources for new artillery ammunition were Frankford and Picatinny Arsenals, while a few ordnance depots were equipped to renovate old ammunition. Private [military] ammunition plants did not exist, and, because of the specialized nature of the process, there were no commercial plants that could be converted to ammunition production.

To meet this situation the Ordnance Department took steps in the summer of 1940 to create something new in American economic life -- a vast interlocking network of ammunition plants owned by the government and operated by private industry. More than 60 of these GOCO (government-owned, contractor-operated) plants were built between June 1940 and December 1942.¹

Designed for loading, assembling, and packing bombs, mines, artillery shells and explosive-train components, IAAP was among the first of the new munitions plants to be authorized and built.

Site Selection and Former Land Use

The IAAP site in southeastern Iowa was approved on the basis of the same criteria used in selecting locations for other load-assemble-and-pack facilities. These considerations included:

- (1) a mid-continental location as a defense against enemy bombardment
- (2) proximity to main railroad lines
- (3) availability of an ample water supply and sufficient electrical power for processing purposes
- (4) availability of suitable labor
- (5) survival remoteness from large centers of population
- (6) availability of large tracts of land to permit necessary safe distances between facilities in both production and storage areas.²

The IAAP site satisfied all criteria, partly because of its proximity to the City of Burlington, Iowa, located about ten miles to the east. Burlington was a regional rail, trade, and industrial center with a population of about 25,000 people. Electrical power was available from the transmission lines of the Mississippi River Power Company, and the site already had a natural water supply system in Long Creek, which would later be improved by a dam and storage reservoir of 480 million gallons.³ When the government took possession of the new plant location in the fall of 1940, the boundaries enclosed approximately 20,450 acres of "what was once a placid easy-going farming community." In addition to about 200 farmsteads, the purchase involved the acquisition of "six school districts, several cemeteries, some churches and . . . the Des Moines County farm for the indigent."⁴

Thirty-four structures from the pre-military period survive within the IAAP's present boundaries; twenty-seven are wood-frame farmhouses (Buildings 3-8, 29-51), most dating from the first quarter of the twentieth century. In 1941 these residences were moved from their original sites and placed on concrete foundations in the IAAP's Administration Area in the north-central section of the installation. The houses are stylistically modest: bungalows and "Midwest squares" predominate (Figures 2, 3).⁵

Three former farm structures remain at their original locations. Two are utilitarian, wood-frame barns from the 1930s (Buildings 500-197-3, 500-30-2) (Figures 4, 5). The third is an elaborate fruit cellar (no building number assigned) (Figure 6) situated in the south-central section of the plant, about one-quarter mile north of Lower Augusta Road and one-quarter mile west of Shilo Cemetery. Erected in 1867, the structure was originally part of the orchard estate of Robert and Henry Avery who, reputedly, operated "the biggest nursery business in the state".⁶ A rare architectural survival of the region's once-flourishing pomology, the fruit cellar is a predominantly earth-sheltered, roughly-cut-and-coursed, limestone building, measuring approximately 20 feet by 60 feet, with an earthen floor about six feet below grade and a vaulted ceiling eleven feet high (Figure 7).⁷ The arched entrance on the west facade originally contained a datestone, inscribed "1867" (Figure 8). This entrance led into a small vestibule, with another archway descending into the vault (Figure 9). Although no wood members survive, both archways were once fitted with wood doors and the vestibule roofed with planking (Figure 10). Despite more than forty years of neglect, the structure is in substantially intact



Figure 2: Building 48 is representative of the many bungalow-style farmhouses that were moved to the administration area in 1941 from other parts of the installation. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)



Figure 3: A typical "Midwest square," Building 40 displays the most common architectural style of the former farmhouses in the administration area. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)



Figure 4: This former barn (Building 500-197-3) is now used as a storage structure.
(Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald
and Mack Partnership.)



Figure 5: Building 500-30-2 is a former barn, currently used as a storage facility.
(Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald
and Mack Partnership.)



Figure 6: Avery Fruit Cellar (no building number assigned), west elevation.
(Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald
and Mack Partnership.)

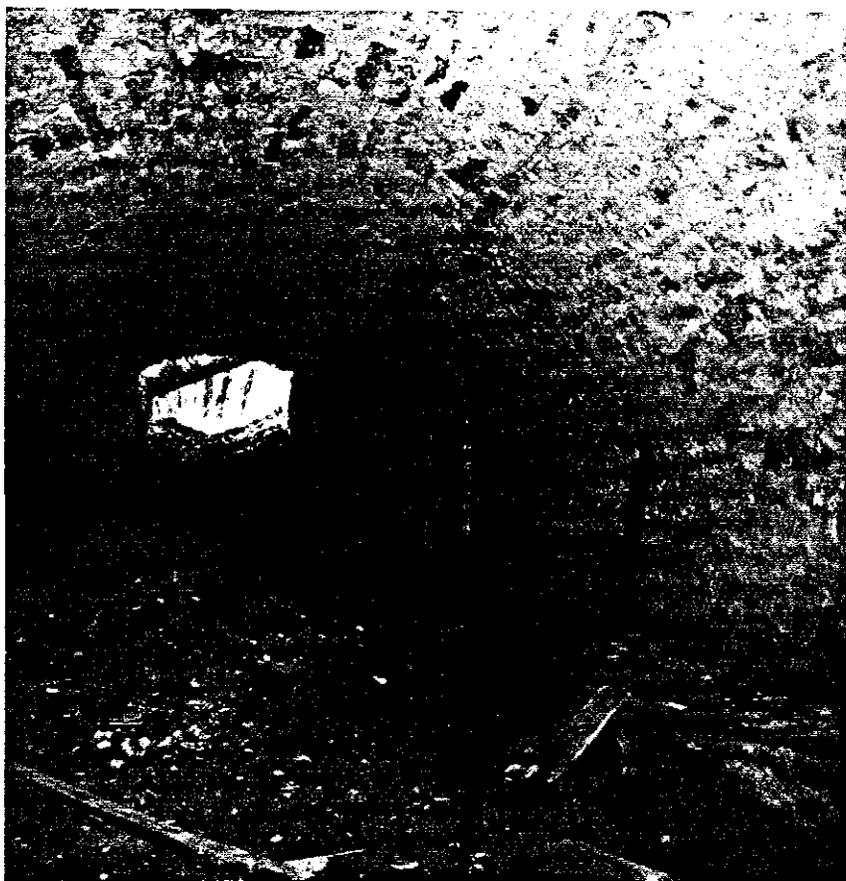


Figure 7: Interior view of Avery Fruit Cellar, looking west. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)

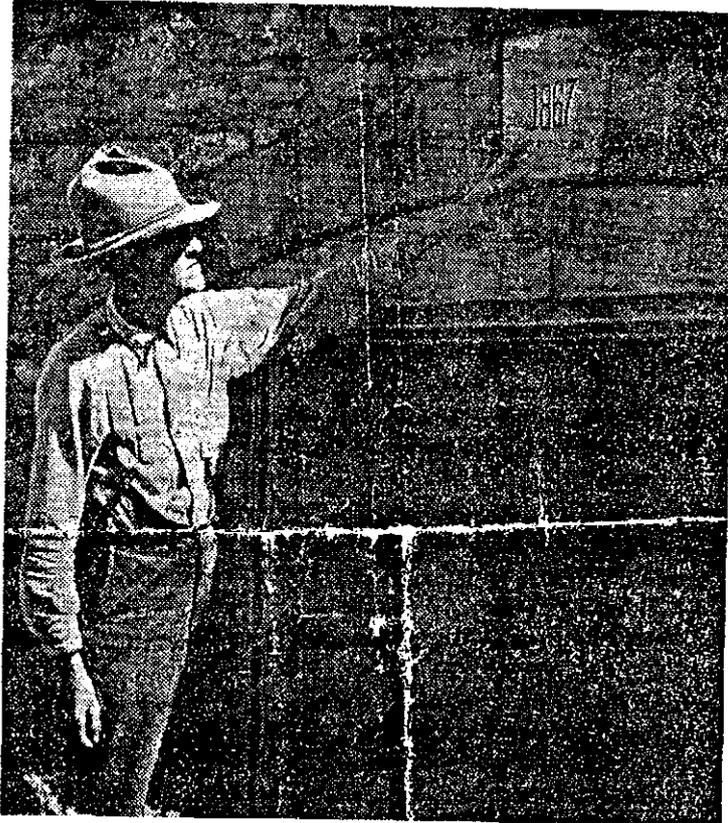


Figure 8: Henry Avery's son Oren points to the datestone on the family fruit cellar in this 1939 photograph. (Source: Des Moines Register, September 24, 1939.)



Figure 9: Archway on west end of the cellar leading from vestibule to vault.
(Source: Field inventory photograph, 1983, Jeffrey A. Hess,
MacDonald and Mack Partnership.)



Figure 10: This photograph, taken shortly after the Army's acquisition of the IAAP site, shows the Avery Fruit Cellar with its west facade intact. The structure is equipped with a wooden door, and the vestibule area, given the darkness of the entrance, appears to be roofed. (Source: Neva Kisling, Waterloo, Iowa. Ms. Kisling is the great, great, granddaughter of Henry Avery.)

condition. It appears today much as it did in an illustration of the Avery estate published in 1873 (Figure 11).

The plant's pre-military structures also include four former public buildings, all on their original sites. Two were built as maintenance facilities for the Des Moines County Home, which occupied a 400-acre site in what is now the northeastern section of IAAP. The larger of the county buildings (Building 200-131-2) (Figure 12), erected about 1900, is a hip-roofed, two-story, brick laundry that was remodeled into a fire station during the military construction program. The smaller (Building BG-1) (Figure 13) is a one-story, brick slaughterhouse, constructed about 1925 and converted by the army into a field office for plant maintenance personnel.⁸ Both are architectural undistinguished. The last two structures antedating military usage are both schoolhouses that remained in pedagogical service until 1940. Situated on Lower Augusta Road in the south-central section of the installation, Hawkeye School (Building 500-30-7) (Figure 14) is a plain, one-story, concrete-block building constructed about 1930.⁹ Winnebago School (Building 500-30-6) (Figure 15), situated near the center of the installation, is of greater architectural interest. It is a one-story gable-roofed building of roughly worked, coursed, ashlar limestone on a sandstone-block foundation. Dressed limestone was used for lintels, sills, and a datestone centered in the north-facade gable, inscribed "Winnebago No. 2 1872." The building is a good example of vernacular stone architecture.

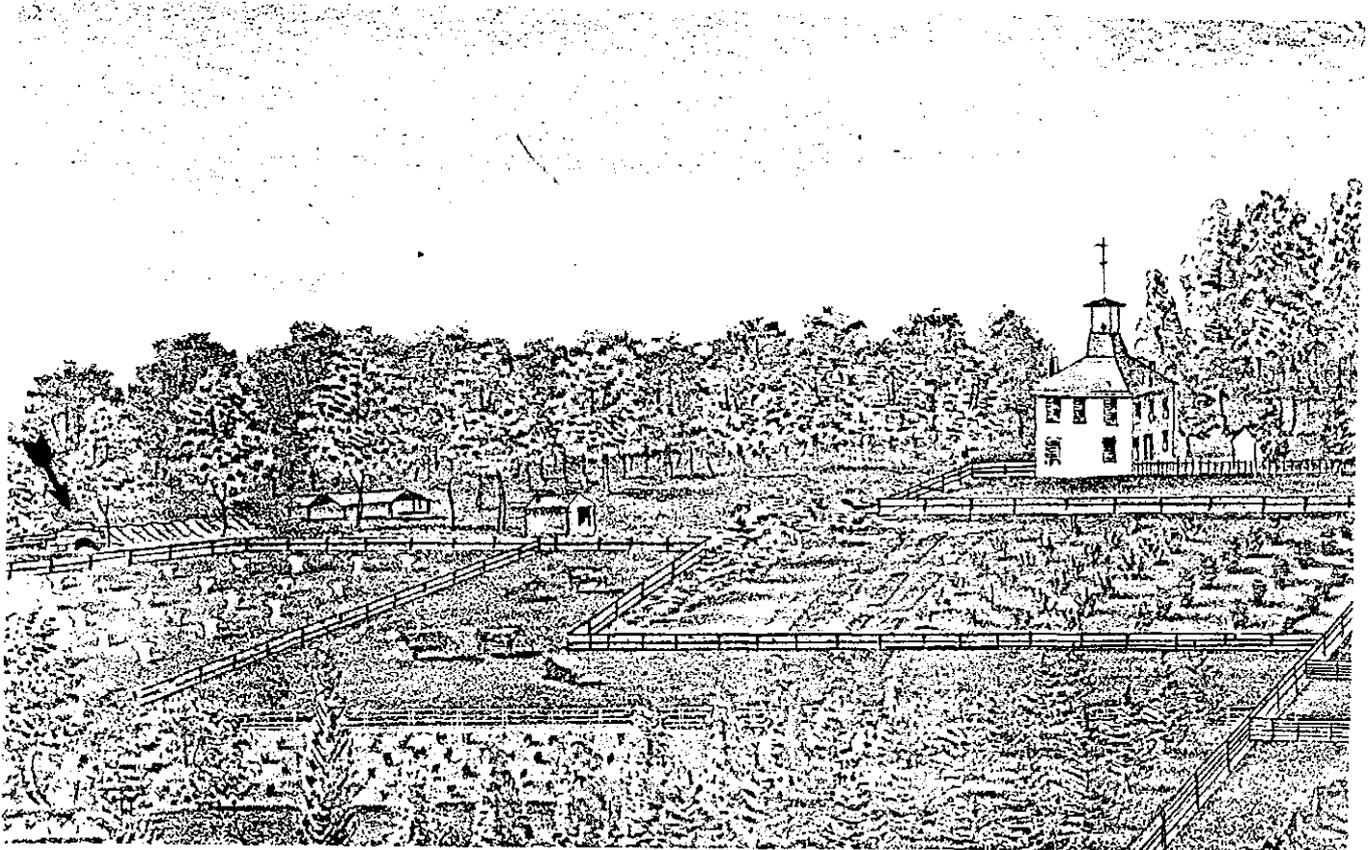


Figure 11: The Avery Fruit Cellar (marked by an arrow) can be seen at the extreme left in this 1873 illustration of the Avery estate. (Source: A. T. Andreas, An Illustrated Historical Atlas of Des Moines County, Iowa [Chicago: A. T. Andreas, 1873.])

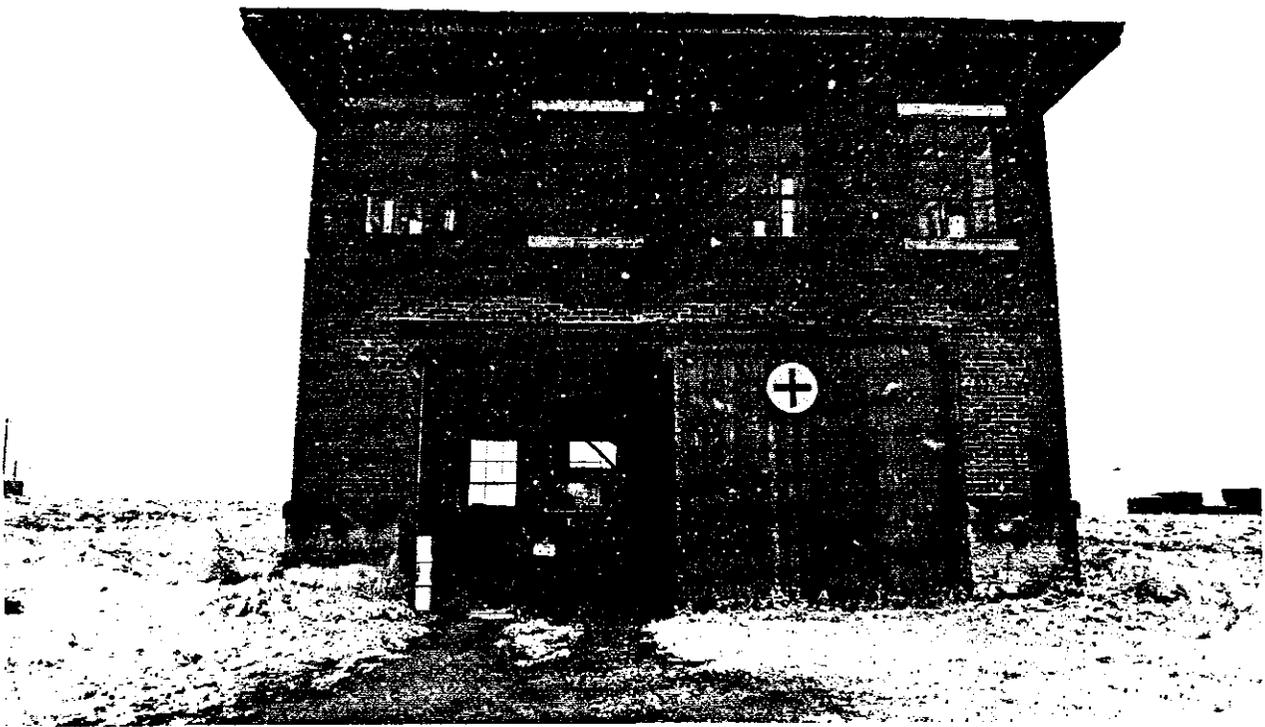


Figure 12: Originally used as a laundry facility by the Des Moines County Home, Building 200-131-2 was remodeled into a fire station in the early 1940s by the military construction program. (Source: Field inventory photograph, Jeffrey A. Hess, MacDonald and Mack Partnership.)



Figure 13: A former slaughterhouse for the Des Moines County Home, Building BG-1 now serves as a field office for IAAP maintenance personnel. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)



Figure 14: The former Hawkeye School (Building 500-30-7) is now vacant. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)



Figure 15: Currently vacant, the former Winnebago School once served as a storage facility for IAAP. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)

Construction

Under the general supervision of the Quartermaster Corps, plant construction began in January 1941. A year later the project was "better than 98 percent complete."¹⁰ Using plans developed by the government's Picatinny Arsenal, Day and Zimmermann Inc. of Philadelphia supplied architectural-engineering services. Construction contracting was handled by a joint venture of A. Guthrie & Co., Inc. of St. Paul and Al Johnson Construction Co. of Minneapolis. The original layout called for a central manufacturing area encircled by a series of storage yards, with an administration compound just to the northwest of the production facilities (Figure 15). The manufacturing area consisted of eleven separate complexes: two for loading, assembling, and packing artillery shells (Lines 1, 2), one for bombs (Line 3), two for fuzes (Lines 4A, 4B), two for boosters (Lines 5A, 5B), one for detonators (Line 6), two for primers (Lines 7, 9), and one for producing crystallized ammonium nitrate (Line 8).¹¹ In June 1941, with construction at the halfway mark, "announcement was made . . . that the plant's facilities would be expanded to include another bomb loading line."¹² Erected in the southwest corner of the installation, this facility (Line 3A) was finished in February 1942. At that time, IAAP comprised approximately 700 buildings, with one-third devoted to manufacturing and one-half to storage.¹³ There was only limited new construction at the installation during the remainder of the war.

In general, the plant's production lines consisted of linear groupings of buildings sufficiently separated to preclude the possibility of catastrophic incident at one line causing sympathetic explosions and/or

structural damage at adjacent lines (Figure 16). These safety distances were calculated according to standard spacing formulae relating distances in feet to quantities of explosives in pounds.¹⁴ As an additional precautionary measure, production buildings made extensive use of "blow-out" construction, which, through a combination of reinforced-concrete blast walls, clay-tile cladding and corrugated-asbestos roofing, was designed to direct the force of possible explosions away from neighboring facilities (Figures 17, 18).

Storage structures, also spaced according to standard safety formulae, were of three basic types: earth-sheltered, reinforced-concrete "igloo" magazines (271 buildings in Yards C, D, F, G, H, J, K) (Figure 19); warehouses with clay-tile cladding (34 buildings in Yard E); and warehouses with corrugated-asbestos cladding (34 buildings in Yard L) (Figure 20).¹⁵ The utilitarian-industrial character of the production and storage facilities was mirrored in the administration area, where such principal structures as the Operator's Office (Building 500-172), Engineering Building (500-118), and Recreation Building (Building 500-116) were of simple, unadorned, wood-frame construction. Only the portico and architrave of the brick and wood-frame Administration Building (Building 100-101) (Figures 21, 22) and the colonial-revival detailing of three wood-frame staff residences (Buildings 1, 2, 52) (Figure 23) showed a measure of stylistic concern.

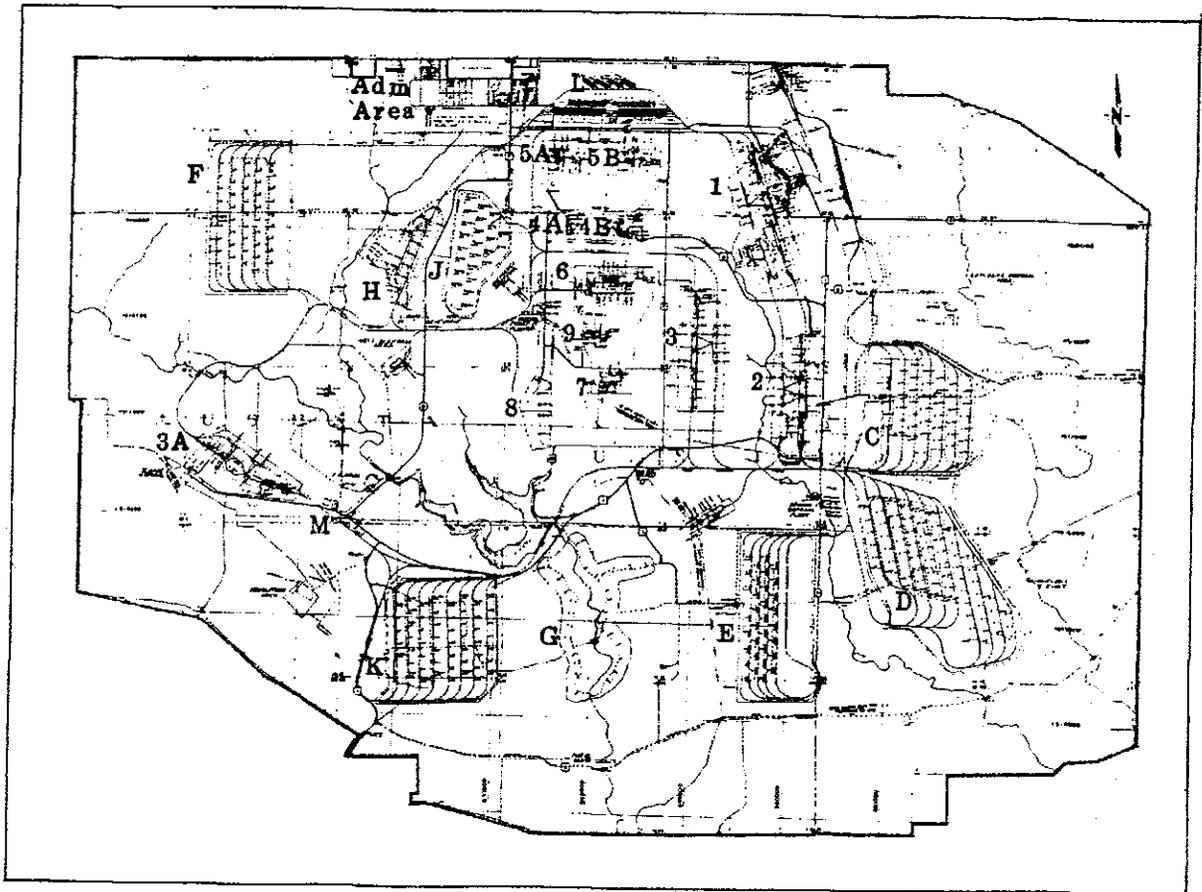


Figure 16: General installation plan of IAAP. (Source: "Iowa Army Ammunition Plant," unpublished brochure prepared by Mason & Hanger-Silas Mason Co., Inc. c. 1980, IAAP Administrative Archives.) Capital letters denote storage yards; numerals production lines.

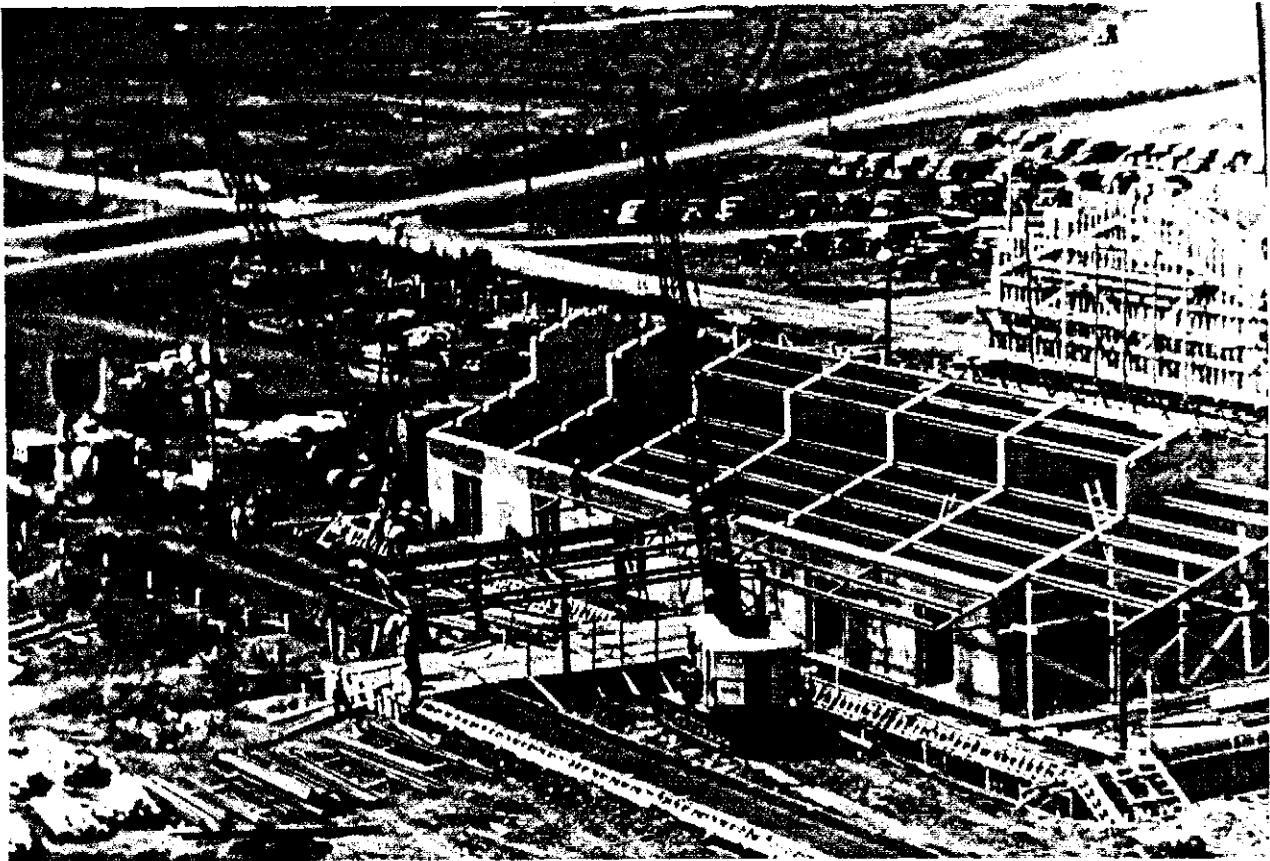


Figure 17: This construction photograph of the Drilling and Boosting Building (Building 2-10) in Line 2 shows typical reinforced-concrete, interior, blast-wall design. (Source: IAAP Administration Archives.)



Figure 18: Designed for loading primers, Building 9-59 shows typical "blow-out" construction. Transverse reinforced-concrete blast walls were intended to protect adjacent facilities in the line by directing the force of possible explosions outward through the clay-tile walls and upward through the roof. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)



Figure 19: Building 60-46-5 is representative of the plant's igloo magazines.
(Source: Field inventory photograph, 1983, Jeffrey A. Hess,
MacDonald and Mack Partnership.)



Figure 20: Building L-4 is representative of World War II warehouses at IAAP.
(Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald
and Mack Partnership.)

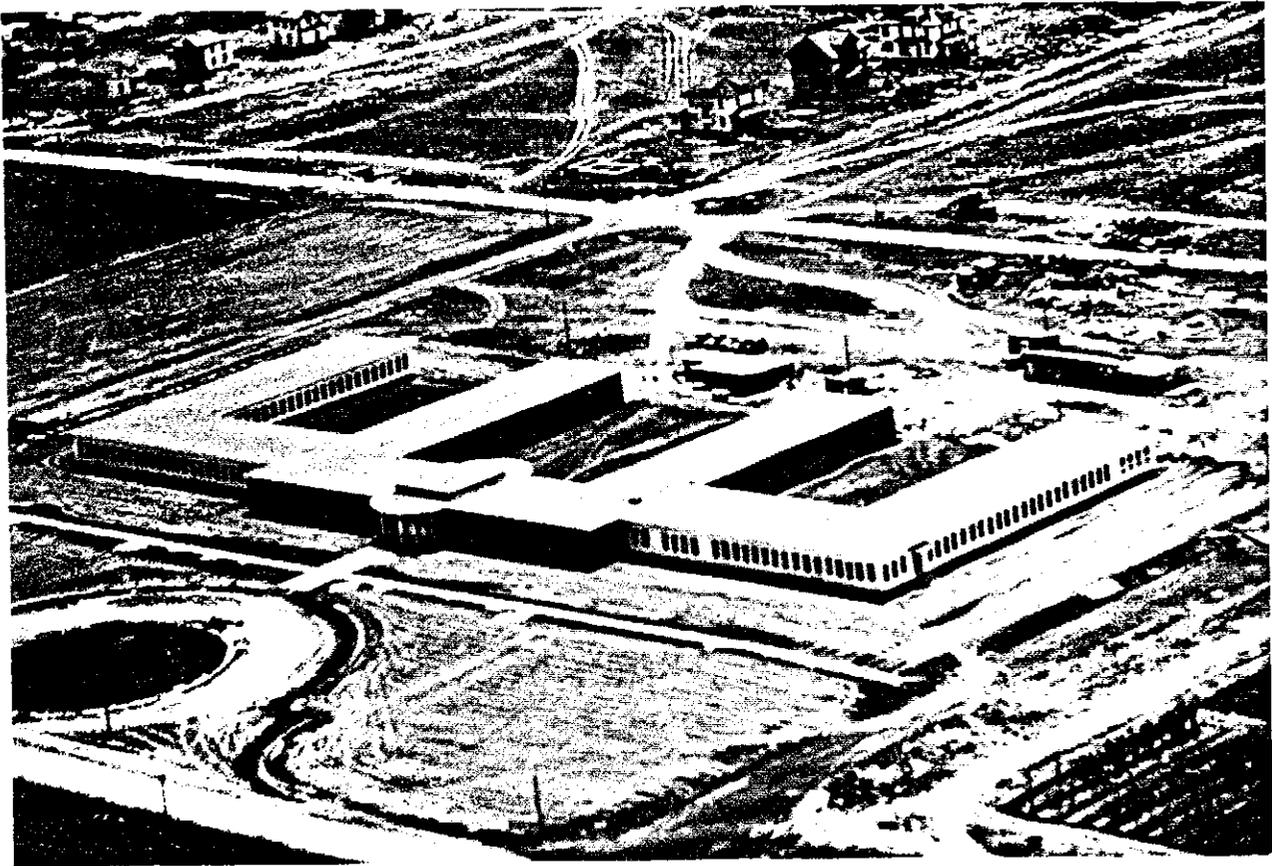


Figure 21: Aerial view of Administration Building (Building 100-101), 1941.
(Source: IAAP Administrative Archives.)



Figure 22: View of north elevation of Administration Building (Building 100-101), showing portico and architrave above main entrance. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)



Figure 23: The colonial-revival detailing of Building 2 is representative of the two other officers' residences (Buildings 1, 52) constructed in 1941. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)

Technology

Under the contract supervision of Day & Zimmermann Inc., IAAP began manufacturing munitions in September 1941, following general methods developed at Picatinny Arsenal. During the next four years, the plant turned out a variety of fully loaded artillery shells, mines, and aerial bombs, along with constituent fuzes, boosters, detonators, and primers.¹⁶ Although procedures varied according to the item in production, the following description for 81 mm shells at Line 1 gives a basic overview of the load-assemble-and-pack process for other ammunition at other lines:

Empty shells are received in a building [Building 1-04] as clean and bright as a new dairy. So much of the loading process is automatic that, from the time the shells arrive until they are taken from the end of the line, they are seldom touched by a human hand. Shell loading is done on a production line roughly similar to an automobile assembly line. Revolving machines carry the empty shells through paint spray booths. After painting, the shells are caught up by overhead tongs which place them in jiggle-proof "tote Boxes," like wooden egg boxes, and a conveyor carries them to the melt-load building [Buildings 1-05-1, 1-05-2].

The conveyors, which were specially designed for this type of plant, link together the various process buildings [which] extend for more than a mile. They have two "tracks" of rollers over which the tote boxes are moved by "pusher" arms extending from a moving chain as a sort of "third rail." The conveyors are explosion-proof and are housed in corrugated asbestos siding and roofing. A conveyor also carries TNT, packed in wooden boxes, to the melt-loading building from another part of the plant [Buildings 1-08-1, 1-08-2, 1-50]. The TNT is melted on fireless stoves, heated by steam, in rooms on the second story [Buildings 1-05-1, 1-05-2], and the liquid is piped downstairs into ladles from which it is poured by hand into the shells [Figure 24] Then they are taken to a drilling building [Building 1-10] where a bore through the solidified TNT is made in the nose of the shell for the booster and fuze. The motors which turn the drills are powered by compressed air and have sparkless bearings. After being drilled[, fuzes and ignition cartridges are inserted in Building 1-12, and] the shells are placed in storage magazines at the plant, ready for trans-shipment to various ordnance depots.

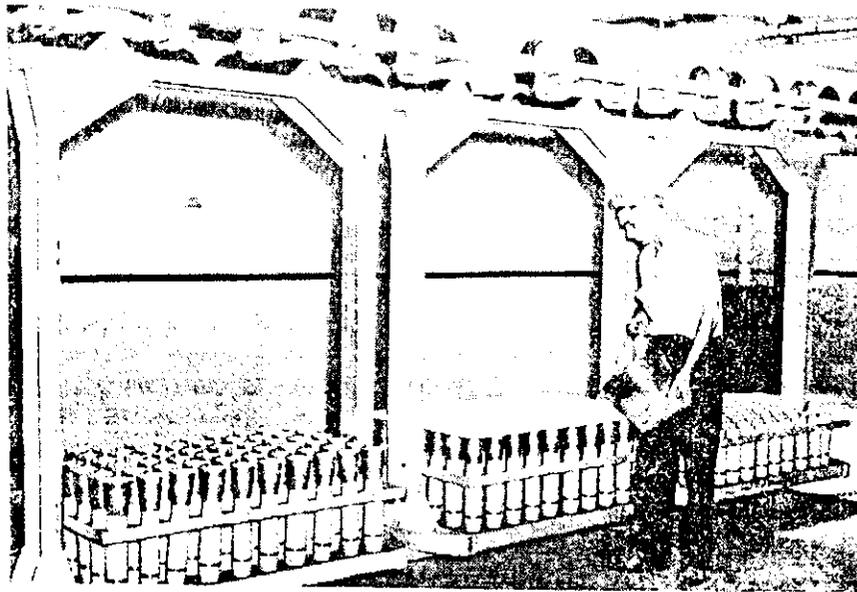


Figure 24: This worker at an unidentified shell-loading plant during World War II demonstrates the hand-pouring of TNT. (Source: W. F. Sherman, "Material Handling and Shell Loading Plants," Iron Age, 149 [March 26, 1942.])

In comparison to bomb and shell loading, the assembling of boosters (Line 6), fuzes (Lines 4A, 4B), detonators (Line 6), and primers (Lines 7, 9) required a less extensive industrial plant. Since smaller quantities of explosives were handled and melt-pour facilities were not required, the lines were more closely spaced and smaller in scale. The production of these subsidiary components was "largely confined to very simple assembly work," involving a great deal of hand sorting and mechanized benchwork. The loading of artillery primers typified the general operation: "metal tubes [were] filled with a specified amount of black powder . . . on a volumetric loading machine. The heads, containing a small percussion element which ignites upon friction from the firing pin, [were then] staked to the loaded bodies." ¹⁸

After the surrender of Japan, most of the plant's production buildings were shut down and placed in standby condition. In early 1946, Day & Zimmermann ended their contractual responsibilities and officially turned all facilities over to the government. No major manufacturing equipment used at IAAP during World War II survives intact at the installation. ¹⁹

KOREAN WAR TO THE PRESENT

IAAP resumed load-assemble-and-pack operations under government supervision in August 1949. The plant remained completely in government hands until January 1951, when Silas Mason Co. of New York, a large construction-engineering firm that had both built and operated munitions facilities during World War II, assumed contract-management responsibilities. Silas Mason, now known as Mason & Hanger-Silas Mason Co., Inc., has continued in

the same role to the present time. Despite rehabilitation work at Lines 2, 3, and 3A during the early 1950s, Korean War production techniques generally conformed to original World War II practices.²⁰ There were, however, two important technological changes in the melt-pour operation, which had been developed at other shell-loading facilities in 1944-1945:

Hand poured loading was replaced by a machine where cups were exactly filled with a load for each of the . . . waiting shells underneath. Then, at the touch of a lever, compressed air was released to open valves above each of the shells to fill them in a matter of a few seconds. This multiple-pouring machine handled one step in the speed process. The other was handled by the multiple core machine Steam heated bayonets were thrust into the TNT to the bottom of the shell casing where air cavities were found to form. This automatic method of eliminating possibility of faulty shell performance from₂₁ cavitation replaced the manpower-consuming, hand puddling process.

Silas Mason first became involved with IAAP in 1947, when the Ordnance Department requested the firm to build and operate a highly classified production complex at Line 1 for the newly established Atomic Energy Commission (AEC).²² This facility, which would eventually comprise over fifty structures (Buildings 1-19 through 1-100-2), extensively used underground construction completely shrouded by a mound of rubberized asbestos compound (Figure 25). Sealed from the outside environment, the structures were designed to collapse inward in the event of accidental detonation. Originally used for manufacturing and shipping atomic bomb components, the plant quickly expanded its production responsibilities; in 1954 it "began to assemble nuclear warheads for guided missiles . . . and handled . . . fissionable material for the first time."²³ The facility continued in use until 1975, when all operations were transferred to the Pantex Plant in Amarillo, Texas.²⁴ Since the interiors of



Figure 25: Formerly used for research and development, Building 1-63-7 typifies the type of underground construction employed at the AEC plant adjacent to Line 1. (Source: Field inventory photograph, 1983, Jeffrey A. Hess, MacDonald and Mack Partnership.)

the former AEC production buildings were off limits to the present survey, the nature of surviving equipment is unknown (see Appendix).

Conventional ammunition production at IAAP markedly declined after the resolution of the Korean War, and employee strength dropped from a peak of 6,282 persons in 1952 to less than 1,400 in 1964. By the end of 1967, however, American military involvement in Southeast Asia had raised IAAP production and employment figures beyond Korean War levels.²⁵ Such output exacted a serious toll from the IAAP's production machinery. As the plant historian noted in 1967, "Much of the equipment at this facility is now getting old and in some cases spare parts . . . are no longer available on an off-the-shelf basis and must be made to order. This is particularly true of some equipment which has been in service for over 25 years."²⁶ To keep pace with Vietnam production quotas, IAAP resorted to piece-meal replacement and automation of older equipment, but the basic manufacturing techniques remained substantially unchanged.²⁷ As late as 1970, a technological study of the plant's loading facilities reported "outdated materials handling equipment," "congestion of facilities," "capacity limitations," "low efficiency," and "manual operations that are potentially hazardous to personnel."²⁸ To remedy these deficiencies, IAAP embarked on a major modernization program that resulted in the complete rebuilding of Lines 4A and 4B, and the retooling of most other production facilities. Modernization also ushered in a host of new products with a special emphasis on anti-armor munitions and guided missile warheads.²⁹ This new technology was off limits to the present study (see Appendix).

NOTES

1. Harry C. Thomson and Lida Mayo, The Ordnance Department: Procurement and Supply (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1960), pp. 104-105.
2. Thomson and Mayo, p. 108.
3. A good historical overview of Burlington is provided by "Historic Sites Survey of Burlington, Iowa," unpublished draft report prepared by The Division of Historic Preservation, Iowa State Historical Department, 1977, Des Moines County Historical Society. Information on electricity and water supply is found in History of Iowa Ordnance Plant, vol. 2, pp. 1-2, unpublished report, c. 1944, IAAP Administrative archives. The installation was originally designated Iowa Ordnance Plant; its present name, which will be used throughout this report, dates from 1963.
4. "Many Changes Since Big Plant Awarded Burlington Year Ago," unidentified newspaper clipping, dated November 7, 1941, in "I.O.P. Scrapbook" (I-B623), Burlington Public Library.
5. History of Iowa Ordnance Plant, vol. 3, p. 73, unpublished report, IAAP Administrative archives. The vernacular architectural style known as "Midwest square" has been described as follows: "Found throughout the nation, this style was particularly common in the central region. . . .The Midwest Square [seems to have evolved from] the low, hip-roofed Italianate. Midwest Square houses are comfortable, informal, clapboard-sided, frame structures. While the wide roof overhands of the Italianate style remain, decorative support brackets have been removed. Unadorned, rectangular frames replace ornate hoods over round- or segmental-arch door and window openings. Standard-sized, double-hung sash are used in place of the tall, narrow, two-paned Italianate window sash. The front porch remains, but with massive, square support posts and balustrade instead of the fussy, turned-wood elements of the Italianate style"; William W. Scott and Jeffrey A. Hess, History and Architecture of Edina, Minnesota (Minneapolis: Setter, Leach & Lindstrom, Inc., 1981), pp. 21-22.
6. Donald Grant, "One Family on 'Avery Place' 103 Years," Des Moines Register, September 24, 1939.
7. Burlington was once known as "Orchard City," and according to Avery family tradition, the nickname, at least partly, derived from fruit trees supplied by the Avery nursery; see Philip D. Jordan, Catfish Bend: River Town and County Seat (Burlington, Iowa: Craftsman Press, Inc., 1975), p. 2; Des Moines Register, September 24, 1939. The rise and decline of nineteenth-century Iowa pomology, with special reference to the Burlington area, is chronicled in Philip D. Jordan, "In the Shade of the Old Apple Tree," Palimpsest, 55 (May/June 1974), 66-77."

8. The local press reported the government's purchase of the County Home as follows: "An agreement was reached early this afternoon between members of the Des Moines county board of supervisors and representatives of the land-acquisition section of the shell-loading plant, whereby the government will pay Des Moines county \$365,000 net for the county farm and buildings thereon The county farm has 396 acres, and there are two main buildings, one for insane patients and the other an infirmary. There are a number of other buildings, barns, etc., that are included in the reported deal"; see "Agree on \$365,000 for Des Moines Co. Farm and Buildings," unidentified newspaper clipping, dated November 23, 1941, in "I.O.P. Scrapbook," Burlington Public Library. The original use of the two surviving county buildings are noted in "Completion Report, Iowa Ordnance Plant, Burlington, Iowa," pp. 641, 646, unpublished report, 1942, IAAP Administrative Archives.
9. The estimated construction date for the building is based on the fact that surviving school board records first mention Hawkeye School in 1931; see "Commencement Exercises of the Des Moines County Rural Schools," (no. pl: no pub., 1931), Des Moines County Historical Society. Both Hawkeye School and Winnebago School disappear from commencement records in 1941.
10. "Huge Plant Building Program Handled in '41," unidentified newspaper clipping, dated January 7, 1942, in "I.O.P. Scrapbook," Burlington Public Library.
11. The contribution of Picatinny Arsenal is noted in "Largest Shell-Loading Plant Goes into Operation," Chemical & Metallurgical Engineering, 48 (August 1941), 89. Construction contracts are discussed in "Historical Report, Iowa Army Ammunition Plant, 1940-1963," pp. 8-9, unpublished report, c. 1963, on microfiche, AMCCOM Historical Office, Rock Island Arsenal. For original plant layout and function of manufacturing lines, see "Iowa Ordnance Plant General Layout," unpublished drawing FS-102 prepared by Day & Zimmermann Inc., July 14, 1941, IAAP Administrative Archives; History, vol. 2, pp. 12-70. IAAP was equipped with an ammonium nitrate plant because "at the beginning of World War II, shortage of TNT for a time necessitated substitution in large bombs of amatol, a mixture of TNT and ammonium nitrate. Amatol had slightly less shattering power --brisance--than TNT, and somewhat less sensitivity to detonation. Later, increased production permitted the use of straight TNT"; see Constance McLaughlin Green and others, The Ordnance Department: Planning Munitions for War (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1955), pp. 452-453. The IAAP facility produced crystallized ammonium nitrate by evaporating a neutral liquid solution of the chemical supplied by other plants. Closed for the duration of the war in 1942, Line 8 was reactivated for the Marshall Plan fertilizer program during the late 1940s. It ceased operation for good in 1950, and most of its buildings were subsequently demolished; see History, vol. 2, pp. 42-43; Gordon E.

Davis, "Historical Summary of the Iowa Ordnance Plant, 2 September 1945 to 1 July 1951," pp. 60-63, unpublished report, 1952, microfiche, AMCCOM Historical Office, Rock Island Arsenal.

12. "Huge Plant Building Program Handled in '41"; "Small Scale Plot Plant," in "Industrial Facilities Inventory, Iowa Ordnance Plant," Part I, Section 5, p. 12, unpublished report prepared Corps of Engineers, U.S. Army, Office of the District Engineer, Omaha, March 1944, AMCCOM Historical Office, Rock Island Arsenal.
13. History, vol. 2, pp. 4-5.
14. According to the Ordnance Department's Safety Officer, "The guiding principles which were followed in laying out [a] plant are: 1. Hazardous operations have been separated from each other by barricades or by placing them in separate buildings. 2. Operating buildings have been separated from each other by safe distances to prevent the spread of fires or explosions. 3. Operating buildings have been grouped into separate production lines whose sizes and capacities are based on efficient and economical operation. . . . 4. Equipment layouts in operating buildings have been made with a view toward eliminating hazards from electrical installations, mechanical or static sparks, and fires from lightning or other causes. 5. Change houses and bomb proof shelters have been provided where necessary for the comfort and safety of operating personnel"; George D. Rogers, "Military Explosives," National Safety News, 44 (July 1941), 22.
15. Thomson and Mayo (p. 361) note that the magazine was "called an 'igloo' from its resemblance to Eskimo shelters [.] It was a low, earth-covered structure of reinforced concrete, its sides arched to form a semicircular roof. The shape directed the power of an explosion upward rather than outward. It was the best type of storage yet devised for such dangerous ammunition as loaded bombs and large-caliber shells." For the type of standard warehouse construction used at IAAP, see E. E. MacMorland, "Ordnance Supply System," Mechanical Engineering, 67 (December 1945), 791-792.
16. "Historical Report, 1940-1963," pp. 8-10.
17. "Largest Shell-Loading Plant Goes into Operation"; see also process descriptions of the various lines in History, vol. 2, pp. 8-70. The conveyor system used at IAAP is described in detail in "Conveyorized Plant Finishes Shells by the Millions," Factory Management, 100 (February 1942), 80-1, 180, 182; "Truck-Tow Conveyors," Steel, 116 (March 12, 1945), 124, 170-176.
18. "Hourly Earnings in the Ammunition-Loading Industry, 1944, : Monthly Labor Review, 60 (April 1945), 840-841.
19. "Historical Report, 1940-1963," p. 10.
20. "Historical Report, 1940-1963," pp. 12-14. On the involvement of Silas Mason with muntions plant construction and operation during

World War II, see Ann Arnold Lemert, First You Take a Pick & Shovel: The Story of the Mason Companies (Lexington, Ky.: The John Bradford Press, 1979), pp. 113-129.

21. "Compressed Air Devices Aid in Speeding up Loading and Handling," Steel, 117 (November 19, 1945), 128. See also L. A. Quayle, "Volumetric Pouring Machine," Mechanical Engineering, 67 (September 1945), 599-606; "Army Develops Mechanical Shell Loading," Chemical & Metallurgical Engineering, 52 (April 1945), 99. It is possible that multiple pour and multiple core machines had been introduced at IAAP near the end of World War II. Although an inventory of the plant's machinery, prepared in the spring of 1944, does not itemize such equipment, a history of the plant, prepared about 1945, notes that "operating methods were improved during the last quarter of 1944 and additions were made to the buldings and equipment. This caused a rise in the production"; see "Industrial Facilities Inventory," Part III, Section 2, pp. 586-602, AMCCOM Historical Office, Rock Island Arsenal; William Voight, Jr., "The Ordnance Organization in World War II," p. 149, unpublished report prepared for the Ordnance Department, c. 1945, microfiche, AMCCOM Historical Office, Rock Island Arsenal.
22. Lemert, pp. 160-166; "Historical Report, 1940-1963," p. 12.
23. Lemert, p. 169.
24. DARCOM Installation and Activity Brochure [for IAAP], p. 4, unpublished, 1980, IAAP Administrative Archives.
25. R. J. Hammond, "Profile on Munitions, 1950-1977," p. 60, unpublished, n.d., microfiche, AMCCOM Historical Office, Rock Island Arsenal.
26. "Unit History, Iowa Army Ammunition Plant, Covering the Period 1 January 1965 Through 31 December 1967," p. 35, unpublished report, 1968, microfiche, AMCCOM Historical Office, Rock Island Arsenal.
27. "Modernization of Plant Equipment, Iowa Army Ammunition Plant, 1964-1970," pp. 1-7, unpublished report, c. 1970, microfiche, AMCCOM Historical Office, Rock Island Arsenal. For example (p. 4): "During 1968 four . . . heavy duty, dual action presses were procured and installed to pellet large high explosive pellets used in adapter boosters for bombs. . . . These presses replaced obsolete single action presses enhancing quality and increased production capability."
28. "Modernization Engineering Report for U. S. Army Ammunition Plants," vol. 1, p. 71, unpublished report prepared for U.S. Army Munitions Command, Dover, N.J., 1970, AMCCOM Historical Office, Rock Island Arsenal.
29. "Iowa Army Ammunition Plant," p. 8, unpublished information brochure prepared by Mason & Hanger-Silas Mason Co., Inc., c. 1980, IAAP Administrative Archives.

Chapter 3

PRESERVATION RECOMMENDATIONS

BACKGROUND

Army Regulation 420-40 requires that an historic preservation plan be developed as an integral part of each installation's planning and long-range maintenance and development scheduling.¹ The purpose of such a program is to:

- . Preserve historic properties to reflect the Army's role in history and its continuing concern for the protection of the nation's heritage.
- . Implement historic preservation projects as an integral part of the installation's maintenance and construction programs.
- . Find adaptive uses for historic properties in order to maintain them as actively used facilities on the installation.
- . Eliminate damage or destruction due to improper maintenance, repair, or use that may alter or destroy the significant elements of any property.
- . Enhance the most historically significant areas of the installation through appropriate landscaping and conservation.

To meet these overall preservation objectives, the general preservation recommendations set forth below have been developed:

Category I Historic Properties

All Category I historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for

nomination regardless of age. The following general preservation recommendations apply to these properties:

- a) Each Category I historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category I historic properties should not be altered or demolished. All work on such properties shall be performed in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).

- b) An individual preservation plan should be developed and put into effect for each Category I historic property. This plan should delineate the appropriate restoration or preservation program to be carried out for the property. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulation. Until the historic preservation plan is put into effect, Category I historic properties should be maintained in accordance with the recommended approaches of the Secretary of Interior's Standards for Rehabilitation and

Revised Guidelines for Rehabilitating Historic Buildings² and in consultation with the State Historic Preservation Officer.

- c) Each Category I historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.³ When no adequate architectural drawings exist for a Category I historic property, it should be documented in accordance with Documentation Level I of these standards. In cases where standard measured drawings are unable to record significant features of a property or technological process, interpretive drawings also should be prepared.

Category II Historic Properties

All Category II historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for nomination regardless of age. The following general preservation recommendations apply to these properties:

- a) Each Category II historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category II historic properties should not be altered or demolished. All work on such properties shall be performed

in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).

- b) An individual preservation plan should be developed and put into effect for each Category II historic property. This plan should delineate the appropriate preservation or rehabilitation program to be carried out for the property or for those parts of the property which contribute to its historical, architectural, or technological importance. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulations. Until the historic preservation plan is put into effect, Category II historic properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings⁴ and in consultation with the State Historic Preservation Officer.
- c) Each Category II historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level

II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.⁵

Category III Historic Properties

The following preservation recommendations apply to Category III historic properties:

- a) Category III historic properties listed on or eligible for nomination to the National Register as part of a district or thematic group should be treated in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800). Such properties should not be demolished and their facades, or those parts of the property that contribute to the historical landscape, should be protected from major modifications. Preservation plans should be developed for groupings of Category III historic properties within a district or thematic group. The scope of these plans should be limited to those parts of each property that contribute to the district or group's importance. Until such plans are put into effect, these properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised

Guidelines for Rehabilitating Historic Buildings⁶ and in consultation with the State Historic Preservation Officer.

- b) Category III historic properties not listed on or eligible for nomination to the National Register as part of a district or thematic group should receive routine maintenance. Such properties should not be demolished, and their facades, or those parts of the property that contribute to the historical landscape, should be protected from modification. If the properties are unoccupied, they should, as a minimum, be maintained in stable condition and prevented from deteriorating.

HABS/HAER Documentation Level IV has been completed for all Category III historic properties, and no additional documentation is required as long as they are not endangered. Category III historic properties that are endangered for operational or other reasons should be documented in accordance with HABS/HAER Documentation Level III, and submitted for inclusion in the HABS/HAER collections in the Library of Congress.⁷ Similar structures need only be documented once.

CATEGORY I HISTORIC PROPERTIES

There are no Category I historic properties at IAAP.

CATEGORY II HISTORIC PROPERTIES

Avery Fruit Cellar (no building number assigned)

- . Background and significance. The Avery Fruit Cellar (see pages 18-19 and Figures 6-10) is located on the site of the former homestead of Robert Avery, a Massachusetts-born farmer who in 1836 settled Section 21 of Union Township in Des Moines County, Iowa (now the south-central section of IAAP). Although all other structures at the site were demolished after the Army acquired the land in 1940, the building still bears a close relationship to two neighboring features surviving from the nineteenth-century landscape. It is a quarter-mile west of Shilo Cemetery, established by the Avery family, and a quarter-mile north of Lower Augusta Road, an original township thoroughfare.⁸

Most of the early settlers of southeastern Iowa were New Englanders, who had been raised on anti-slavery politics, town meetings, and wine-red apples. Although the new homesteaders could satisfy their craving for the first two items with little difficulty, the third required some careful nurturing. "I wish you would send me some apple seeds," wrote one early Burlington settler in 1837 to a brother back East, "I can do a good business with them."⁹ Robert Avery and his son Henry were other early residents who recognized the commercial potential of apples. The two men started an orchard and nursery business on their family farm in Union Township, and by 1849, they were advertizing "twenty thousand fruit trees for sale [,] the majority . . . apple trees."¹⁰ According to Avery family tradition,

the City of Burlington's former nickname, "Orchard City," derived from the apple trees supplied by the Avery nursery.¹¹

After marrying in 1842, Henry continued to reside on the family homestead and was responsible for developing what was apparently the "biggest nursery business in the state." He built the fruit cellar in 1867 to store apples, cider, and wine.¹² Apple culture remained an important agricultural pursuit in Iowa until the last quarter of the nineteenth century, when blight and competition from Michigan fruit led to its demise.¹³ Because the Avery Fruit Cellar is a rare architectural expression of Iowa's once-flourishing pomology, it is a Category II historic property. It should be nominated to the National Register.

. Condition and potential adverse impact. Although the structure has been abandoned since 1940, it is in substantially intact condition. The building appears today much as it did in an illustration published in 1873 (Figure 11). The most pressing structural deficiencies are the collapse of the soldier course of the arch on the west facade, and the partial collapse of the vault's east wall. The fruit cellar is also missing its datestone, doors, and vestibule roof. There are no current plans to alter or demolish this property.

. Preservation options. See the general preservation recommendations at the beginning of this chapter for Category II historic properties eligible for nomination to the National Register. Since the building does not receive any maintenance and is in danger of further

deterioration, it is essential that an appropriate preservation and restoration plan be developed by qualified professionals and implemented as soon as possible. Such a plan should be accompanied by an archaeological investigation of the Avery homestead in order to locate missing architectural elements of the cellar and to establish its original site relationship to former buildings. The fruit cellar appears to be sufficiently removed from munitions production and storage facilities to warrant the investigation of ways to increase its public accessibility.

CATEGORY III HISTORIC PROPERTIES

Winnebago School (Building 500-30-6)

- . Background and significance. Situated near the center of IAAP, Winnebago School (see page 28 and Figure 15) is a one-story, stone building with a datestone centered in the north-facade gable, inscribed "Winnebago No. 2 1872." The "No. 2" referred to the official number of the school sub-district that the building originally served.¹⁵ The building remained in continuous use as a school until its purchase by the Army in 1940.¹² As a local landmark of the former Union Township community, and as a good example of stone vernacular architecture, Winnebago School is a Category III historic property.
- . Condition and potential adverse impact. Recently used as a storage structure, the building is currently vacant. It does not receive any

maintenance. The most serious structural deficiencies are severely deteriorated roofing, partially fallen ceiling, and collapsed stonework on the west facade. The building also requires repointing. There are no current plans to alter or demolish this property.

Preservation options. See the general preservation recommendations at the beginning of this chapter for Category III historic properties not eligible for the National Register. Considerations should be given to stabilizing the structure by weatherproofing it and providing other basic repair work.

NOTES

1. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).
2. National Park Service, Secretary of Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings, 1983 (Washington, D.C.: Preservation Assistance Division, National Park Service, 1983).
3. National Park Service, "Archeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines," Federal Register, Part IV, 28 September 1983, pp. 44730-44734.
4. National Park Service, Secretary of the Interior's Standards.
5. National Park Service, "Archeology and Historic Preservation."
6. National Park Service, Secretary of the Interior's Standards.
7. National Park Service, "Archeology and Historic Preservation."
8. The Avery estate (with orchard duly noted), Shilo Cemetery, and Lower Augusta Road are featured in a map of Union Township published in A. T. Andreas, An Illustrated Historical Atlas of Des Moines County, Iowa (Chicago: A. T. Andreas, 1873), p. 89. The same source (n.p.) gives the following biographical sketch of Robert Avery: "Robert Avery, the fourth son of Robert and Lydia Avery (White), was born in Shelbourne County, Mass. Feb. 20, 1796. His ancestors were from Bristol, England, coming to America before the Revolutionary period. His parents having died in New York, he migrated to Illinois, and from thence to Missouri. While in Missouri, he was married to Nancy Brown, a

native of North Carolina. . . . By this union ten children have been born to them, only three of whom are now living; Henry, the only son, resides in Union Township. . . . Soon after his marriage, Mr. Avery returned to Illinois, where he lived until 1836, at which time he came to this State and located in Union Township While farming both in Illinois and this State, he gave his attention to fruit growing, and as such he was among the most successful of his competitors. He now lives with his only son Henry. . . ."

9. Quoted in Philip D. Jordan, Catfish Bend: River Town and County Seat (Burlington, Iowa: Craftsman Press, Inc., 1975), p. 5.
10. Philip D. Jordan, "In the Shade of the Old Apple Tree," Palimpsest, 55 (May/June 1974), 68.
11. Jordan, Catfish Bend, p. 2; Donald Grant, "One Family on 'Avery Place' 103 Years," Des Moines Register, September 24, 1939.
12. The Des Moines Register article contains an interview with Henry's son Oren, who credits his father for the success of the nursery business; the article also furnishes a photograph of the fruit cellar with the datestone intact. According to Oren, the storage of wine was short-lived: "Oren the present Avery, crawled over the door [of the cellar] as a small boy, drank too much wine [and] was discovered by his father. 'The next day,' said Oren, 'Father plowed up the vineyards.'" At the time of the interview, the cellar was unused: "Only a few potatoes are kept nowadays in the cool cellar with a high vaulted roof." Henry Avery's success in pomology is noted in Biographical Review of Des Moines County, Iowa (Chicago: Hobart Publishing Company, 1905), p. 402: "At any early age Henry Avery became interested in fruit raising and in the nursery business, and loved the study of horticulture. In this department of labor he became widely known, and in his home county his opinions were regarded as authority on many matters connected with horticultural pursuits."
13. Jordan, "In the Shade of the Old Apple Tree," 70-76.
14. Augustine M. Antrobus, History of Des Moines County Iowa and Its People (Chicago: The S. J. Clarke Publishing Company, 1915), p. 511.
15. Available school records mention Winnebago School for the last time in "Commencement Exercises of the Des Moines County Rural Schools [1941]" (No pl.: no pub., 1941), Des Moines County Historical Society.

BIBLIOGRAPHY

- Andreas, A. T. An Illustrated Historical Atlas of Des Moines County, Iowa. (Chicago: A. T. Andreas, 1873). Contains illustration of Avery estate showing fruit cellar.
- Antrobus, Augustine M. History of Des Moines County Iowa and Its People. Chicago: The S. J. Clarke Publishing Company, 1915. Briefly mentions organization of school district served by Winnebago School.
- "Army Develops Mechanical Shell Loading." Chemical & Metallurgical Engineering, 52 (April 1945), 99.
- Biographical Review of Des Moines County Iowa. Chicago: Hobart Publishing Company, 1905. Contains biographical sketch of Henry Avery.
- "Commencement Exercises of the Des Moines County Rural Schools" (No pub., 1930-1941). Des Moines County Historical Society. Provide data on use of Hawkeye and Winnebago Schools during 1930s.
- "Completion Report, Iowa Ordnance Plant, Burlington, Iowa." Unpublished report, 1942. IAAP Administrative Archives.
- "Compressed Air Devices Aid in Speeding up Loading and Handling." Steel, 117 (November 19, 1945), 128. Describes multiple-pouring and multiple-coring machines at shell-loading plants.
- "Conveyorized Plant Finishes Shells by the Million." Factory Management, 100 (February 1942), 80-81. Description of materials-handling systems at IAAP.
- "DARCOM Installation and Activity Brochure [for Iowa Army Ammunition Plant]." Unpublished, 1980. AMCCOM Historical Office, Rock Island Arsenal.
- Davis, Gordon E. "Historical Summary of the Iowa Ordnance Plant, 2 September 1945 to 1 July 1951." Unpublished report, 1952. Microfiche, AMCCOM Historical Office, Rock Island Arsenal.
- Grant, Donald. "One Family on 'Avery Place' 103 Years." Des Moines Register, September 24, 1939. Discusses Avery family, nursery business, and fruit cellar; contains photograph of cellar with datestone intact.
- Green, Constance McLaughlin and others. The Ordnance Department: Planning Munitions for War. Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1955. Standard study of munitions development by United States during World War II.
- Hammond, R. J. "Profile on Munitions, 1950-1970." Unpublished, n.d. Microfiche, AMCCOM Historical Office, Rock Island Arsenal. Brief

sketch of IAAP's manufacturing activities during World War II, Korean War, and Vietnam War.

Historic American Buildings Survey/Historic American Engineering Record, National Park Service. Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures. Unpublished draft, 1982.

"Historic Sites Survey of Burlington, Iowa." Unpublished draft report prepared by The Division of Historic Preservation, Iowa State Historical Department, 1977. Des Moines County Historical Society.

"Historical Report, Iowa Army Ammunition Plant, 1940-1963." Unpublished report, c. 1964. Microfiche, AMMCOM Historical Office, Rock Island Arsenal.

History of Iowa Ordnance Plant, vols. 2, 3. Unpublished report, c. 1944. IAAP Administrative Archives. Provides detailed descriptions of plant construction and technology.

"Hourly Earnings in the Ammunition-Loading Industry, 1944." Monthly Labor Review, 60 (April 1945), 837-851. Contains excellent overview of load, assemble, and pack operations at IAAP and similar facilities.

Hoy, Suelen M., and Robinson, Michael C., eds. Public Works History in the United States. Nashville: American Association for State and Local History, 1982.

"Industrial Facilities Inventory, Iowa Ordnance Plant." Unpublished report prepared by Corps of Engineers, U. S. Army, Office of the District Engineers, Omaha, March 1944. AMCCOM Historical Office, Rock Island Arsenal. Detailed account of construction of IAAP; contains photographs and plans of facilities, inventory of production equipment, and site plans.

"IOP Construction an All-Out Effort." Burlington Hawk-Eye, July 9, 1961. Photographic review of World War II construction program at plant.

"I.O.P Scrapbook." I-B-623, Burlington Public Library. Contains numerous newspaper clippings on the plant's construction and operation during World War II.

"Iowa Army Ammunition Plant." Unpublished brochure prepared by Mason & Hanger-Silas Mason Co., Inc., c. 1980. IAAP Administrative Archives.

"Iowa Ordnance Plant General Layout." Unpublished drawing FS-102, prepared by Day & Zimmermann Inc., July 14, 1941. IAAP Administrative Archives.

Jessup, John E., and Coakley, Robert W. A Guide to the Study and Use

of Military History. Washington, D. C.: U. S. Government Printing Office, 1979.

Jordan, Philip D. Catfish Bend: River Town and County Seat (Burlington, Iowa: Craftsman Press, Inc., 1975). History of Burlington, Iowa with reference to apple growing.

_____. "In the Shade of the Old Apple Tree." Palimpsest, 55 (May/June 1974), 66-77. Places Avery nursery in context of southeastern Iowa's pomology during nineteenth century.

"Largest Shell-Loading Plant Goes Into Operation." Chemical & Metallurgical Engineering, 48 (August 1941), 89. Brief description of IAAP's technology.

Lenert, Ann Arnold. First You take a Pick & Shovel: The Story of the Mason Companies. Lexington, Ky.: The John Bradford Press, 1979.

MacMorland, E. E. "Ordnance Supply System." Mechanical Engineering, 67 (December 1945), 789-797. Good general overview of warehouse and magazine construction at ordnance depots and plants during World War II.

"Modernization Engineering Report for U. S. Army Ammunition Plants," vol. 1. Unpublished report prepared for U. S. Army Munitions Command, Dover, N.J., 1970. AMCCOM Historical Office, Rock Island Arsenal.

"Modernization of Plant Equipment, Iowa Army Ammunition Plant, 1964-1970." Unpublished report, c. 1970. Microfiche, AMCCOM Historical Office, Rock Island Arsenal.

National Park Service. "Archeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines." Federal Register, Part IV (September 28, 1983), 44730-44734.

_____. How to Complete National Register Forms. Washington, D. C.: Washington, D. C.: U. S. Government Printing Office, 1977.

_____. Secretary of Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings, 1983. Washington, D. C.: Preservation Assistance Division, National Park Service, 1983.

Quayle, L. A. "Volumetric Pouring Machine." Machanical Engineering, 67 (September 1945), 599-606.

Rogers, George D. "Military Explosives." National Safety News, 44 (July 1944), 22-23, 77-80. Outlines safety features in munitions plant layout.

Scott William W. and Jeffrey A. Hess, History and Architecture of Edina, Minnesota. Minneapolis: Setter, Leach & Lindstrom, Inc., 1981. Descriptions of Midwest farmhouse styles applicable to pre-military housing at IAAP.

Sherman, W. F. "Material Handling at Shell Loading Plants." Iron Age, 149 (March 26, 1942), 62-66.

Thomson, Harry C. and Mayo, Lida. The Ordnance Department: Procurement and Supply. Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1960. Standard history of development and production of munitions by United States during World War II.

"Truck-Tow Conveyors." Steel, 116 (March 12, 1945), 124.

"Unit History, Iowa Army Ammunition Plant, Covering the Period 1 January 1965 Through 31 December 1967." Unpublished report, 1968. Microfiche, AMCCOM Historical Office, Rock Island Arsenal.

United States Army Armament Materiel Readiness Command. Catalog of Common Sources, Fiscal Year 1983. No pl.: A



REPLY TO
ATTENTION OF:

May 2, 1984

Operation Review

[APPENDIX]

MacDonald and Mack Partnership
ATTN: Mr. Jeffery A. Hess, Historical Consultant
215 Grain Exchange Building
Minneapolis, MN 55415

Dear Mr. Hess:

Reference letter, DRCIS-ER, HQ, DARCOM, 28 October 1982, designating you as Historical Consultant to perform the DARCOM Historic/Archeological Survey at Iowa AAP.

This letter confirms our telephone conversation of May 1, 1984 concerning our prohibiting you from taking interior photographs in production lines 1, 2, 4A, 5B and 9. Processes and equipment in these areas at the time of your survey, 28 thru 30 November 1983, were either classified or highly sensitive and therefore we were not able to grant permission to take photographs in those areas. As we previously agreed, the processes were relatively new or in development and not being able to photograph them would not have adverse effects on your survey.

Sincerely,

Kermit F. Gombert, Jr.
Captain, Ordnance Corps
Acting Commander